CLAIMS:

[C001] A bearing assembly for supporting a rotating component of a rotary machine comprising:

a bearing housing;

a metallic clearance seal having at least one tooth; said metallic clearance seal attached to said bearing housing is configured to extend radially outward from said bearing housing in a spaced apart relationship with said rotating component to define an envelope having a pre-determined cross-sectional shape; and

a non-metallic brush seal assembly fixedly attached to said metallic clearance seal having a second pre-determined cross-sectional shape; said non-metallic brush seal assembly adapted to said metallic clearance seal to extend through said envelope and terminate in substantially intimate contact with said rotating component;

wherein said non-metallic brush seal assembly comprises a plurality of fibers to substantially arrest leakage of a lubricant from said bearing housing to said envelope.

[C002] The bearing assembly in accordance with claim 1, wherein said non-metallic brush seal assembly further comprises at least a pair of bristle holding plates for securing said plurality of fibers.

[C003] The bearing assembly in accordance with claim 2, wherein said non-metallic brush seal assembly further comprises anti-rotation pins affixed to said metallic clearance seal to prevent circumferential displacement of the non-metallic brush seal assembly relative to the metallic clearance seal.

[C004] The bearing assembly in accordance with claim 1, wherein said metallic clearance seal comprises a labyrinth seal.

[C005] The bearing assembly in accordance with claim 1, wherein said pre-determined first cross-sectional shape comprises at least one of an inverted L-shaped cross section or inverted U-shaped cross-section or F-shaped cross-section or T-shaped cross-section or H-shaped cross-section.

[C006] The bearing assembly in accordance with claim 1, wherein said non–metallic fibers are selected from the group consisting of polymer fibers, carbon fibers, graphite fibers, ceramic fibers and combinations thereof.

[C007] The bearing assembly in accordance with claim 1, wherein each of said non-metallic fibers has diameter in the range from about 0.2 mils to about 6 mils.

[C008] The bearing assembly in accordance with claim 7, wherein each of said non-metallic fibers has diameter in the range from about 0.4 mils to about 1 mil.

[C009] The bearing assembly in accordance with claim 1, wherein each of said non-metallic fibers has stiffness in the range from about 0.2 psi/mil to about 20 psi/mil.

[C010] The bearing assembly in accordance with claim 9, wherein each of said non-metallic fibers has stiffness in the range from about 0.4 psi/mil to about 5 psi/mil.

[C011] The bearing assembly in accordance with claim 1, wherein said plurality of non-metallic fibers have a packing density in the range from about 1000 per square inch to about 300,000 per square inch.

[C012] The bearing assembly in accordance with claim 11, wherein said plurality of non-metallic fibers have a packing density in the range from about 150,000 per square inch to about 250,000 per square inch

[C013] The bearing assembly in accordance with claim 1, wherein each of said non-metallic fibers has a laying angle in the range from about 0^0 to about 45^0.

[C014] The bearing assembly in accordance with claim 13, wherein each of said non-metallic fibers has a laying angle in the range from about 20^0 to about 40^0.

[C015] The bearing assembly in accordance with claim 1, wherein said plurality of non-metallic fibers has an average fence height in the range from about 20 mils to about 100 mils.

[C016] The bearing assembly in accordance with claim 15, wherein said plurality of non-metallic fibers has an average fence height in the range from about 30 mils to about 60 mils.

[C017] The bearing assembly in accordance with claim 1, wherein said rotating component has a friction-resistant layer disposed thereon.

[C018] The bearing assembly in accordance with claim 17, wherein said friction-resistant layer comprises a self-lubricating material.

[C019] A bearing assembly for supporting a rotating component of a rotary machine comprising:

a bearing housing;

a metallic clearance seal having at least one tooth; said metallic clearance seal attached to said bearing housing is configured to extend radially outward from said bearing housing in a spaced apart relationship with said rotating component to define an envelope having inverted L-shaped cross-section; and

a non-metallic brush seal assembly fixedly attached to said metallic clearance seal having said inverted L-shaped cross-section; said non-metallic brush seal assembly adapted to said metallic clearance seal to extend through said envelope and terminate in substantially intimate contact with said rotating component having a friction-resistant layer disposed thereon; said friction-resistant layer further comprising a self-lubricating material;

wherein said non-metallic brush seal assembly comprises a plurality of polymer fibers to substantially arrest leakage of a lubricant from said bearing housing to said envelope.

[C020] The bearing assembly in accordance with claim 19, wherein each of said non-metallic fibers has diameter in the range from about 0.4 mils to about 1 mil.

[C021] The bearing assembly in accordance with claim 19, wherein each of said non-metallic fibers has stiffness in the range from about 0.4 psi/mil to about 5 psi/mil.

[C022] A method for retrofitting a non-metallic brush seal in a bearing assembly comprising the steps of:

accessing an existing metallic clearance seal having a plurality of teeth; said metallic clearance seal attached to said bearing housing;

machining at least one tooth of said existing metallic clearance seal to form an envelope having a pre-determined cross-sectional shape adapted to receive a non-metallic brush seal assembly wherein said non-metallic brush seal assembly comprises a plurality of fibers for substantially arresting leakage of a lubricant from said bearing housing to said envelope;

assembling said non-metallic brush seal assembly in said envelope having said pre-determined cross-sectional shape; and

securing said non-metallic brush seal assembly with said metallic clearance seal to prevent circumferential displacement of said non-metallic brush seal assembly relative to said metallic clearance seal.

[C023] The method in accordance with claim 22, wherein said metallic clearance seal comprises a labyrinth seal.

[C024] The method in accordance with claim 22, wherein said pre-determined cross-sectional shape comprises at least one of an inverted L-shaped cross section or inverted U-shaped cross-section or F-shaped cross-section or T-shaped cross-section or H-shaped cross-section.

[C025] The method in accordance with claim 22, wherein said non–metallic fibers are selected from the group consisting of polymer fibers, carbon fibers, graphite fibers, ceramic fibers and combinations thereof.

[C026] The method in accordance with claim 22, wherein each of said non-metallic fibers has diameter in the range from about 0.4 mils to about 1 mil.

[C027] The method in accordance with claim 22, wherein each of said non-metallic fibers has stiffness in the range from about 0.4 psi/mil to about 5 psi/mil.